PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference RCA 88784	**FOR FURTHER ACTION**	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/US 98/ 18059	International filing date *(day/month/year)* 01/09/1998	(Earliest) Priority Date *(day/month/year)* 12/12/1997

Applicant

THOMSON CONSUMER ELECTRONICS, INC. et al.

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of _____3_____ sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

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1. [ ] **Certain claims were found unsearchable** (see Box I).

2. [ ] **Unity of invention is lacking** (see Box II).

3. [ ] The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing

    [ ] filed with the international application.

    [ ] furnished by the applicant separately from the international application,

        [ ] but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

    [ ] Transcribed by this Authority

4. With regard to the **title,** [X] the text is approved as submitted by the applicant

    [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**

    [X] the text is approved as submitted by the applicant

    [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is:

    Figure No. ___NONE___ [ ] as suggested by the applicant.   [X] None of the figures.

                            [ ] because the applicant failed to suggest a figure.

                            [ ] because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6   H04M1/72

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6   H04M   H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 304 998 A (PHILIPS NV) 1 March 1989	1,8,10
Y	see column 2, line 29 – column 3, line 3	2,3,11, 12
	see column 4, line 5-10; figure 1 see column 5, line 43 – column 6, line 49; figure 5	
A	see column 6, line 18-22	9

Y	US 5 495 520 A (KOJIMA SUSUMU) 27 February 1996 see abstract; figure 1 see column 2, line 5-54	2,3

Y	US 5 625 888 A (RUETHER RALF ET AL) 29 April 1997	11,12
A	see column 2, line 10-41; claim 1	4

	-/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international ·filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such docu- ments, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 December 1998	18/12/1998

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	De Biolley, L

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 301 573 A (NIPPON ELECTRIC CO) 1 February 1989 see column 1, line 32 - column 2, line 3 ---	6,7
A	US 5 371 783 A (HEUNG CHARLEY ET AL) 6 December 1994 see abstract see column 3, line 13-17 see column 3, line 54 - column 5, line 57 -----	1,5,8, 11,12

1

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
EP 0304998	A	01-03-1989	GB	2209109 A	26-04-1989
			DE	3882182 A	12-08-1993
			DE	3882182 T	27-01-1994
			HK	140294 A	16-12-1994
			JP	1071331 A	16-03-1989
			KR	9702755 B	10-03-1997
			SG	146694 G	16-06-1995
			US	4905272 A	27-02-1990
US 5495520	A	27-02-1996	JP	2531349 B	04-09-1996
			JP	7038955 A	07-02-1995
US 5625888	A	29-04-1997	DE	4236778 A	05-05-1994
			AU	673202 B	31-10-1996
			AU	5148093 A	24-05-1994
			CA	2148278 A	04-05-1994
			CA	2148287 A	11-05-1994
			WO	9410785 A	11-05-1994
			DE	59306696 D	10-07-1997
			DK	667078 T	29-12-1997
			EP	0667078 A	16-08-1995
			ES	2103491 T	16-09-1997
			FI	952050 A	28-04-1995
			JP	2726160 B	11-03-1998
			JP	7508631 T	21-09-1995
EP 0301573	A	01-02-1989	JP	1036130 A	07-02-1989
			JP	2564839 B	18-12-1996
			JP	1129557 A	22-05-1989
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			JP	6054925 B	20-07-1994
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			HK	143194 A	23-12-1994
			SG	153194 G	28-04-1995
			US	4864599 A	05-09-1989
US 5371783	A	06-12-1994	CA	2059734 A,C	30-11-1992
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			GB	2268370 A,B	05-01-1994
			JP	7087561 A	31-03-1995
			US	5297203 A	22-03-1994

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 10 August 1999 (10.08.99)	
International application No. PCT/US98/18059	**Applicant's or agent's file reference** RCA 88784
International filing date (day/month/year) 01 September 1998 (01.09.98)	**Priority date** (day/month/year) 12 December 1997 (12.12.97)

Applicant

RAMASWAMY, Kumar et al

1. The designated Office is hereby notified of its election made:

    [X] in the demand filed with the International Preliminary Examining Authority on:

    29 June 1999 (29.06.99)

    [ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

    [ ] was not

    made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Lazar Joseph Panakal
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

Form PCT/IB/331 (July 1992)

2779061

PATENT COOPERATION TRE

To:	
TRIPOLI, J. THOMSON MULTIMEDIA LICENSING INC. P.O. Box 5312 Princeton, New Yersey 08540 ETATS-UNIS D'AMERIQUE	

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing *(day/month/year)*	16.03.2000

Applicant's or agent's file reference RCA 88784	**IMPORTANT NOTIFICATION**

International application No. PCT/US98/18059	International filing date *(day/month/year)* 01/09/1998	Priority date *(day/month/year)* 12/12/1997

Applicant THOMSON CONSUMER ELECTRONICS, INC. et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

   The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

   Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

   For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/	Authorized officer	
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Finnie, A Tel.+49 89 2399-8251	

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PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference RCA 88784	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)

International application No. PCT/US98/18059	International filing date *(day/month/year)* 01/09/1998	Priority date *(day/month/year)* 12/12/1997

International Patent Classification (IPC) or national classification and IPC H04M1/72

Applicant THOMSON CONSUMER ELECTRONICS, INC. et al.

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

   I   ☒ Basis of the report
   II ☐ Priority
   III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   IV ☐ Lack of unity of invention
   V   ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   VI ☐ Certain documents cited
   VII ☒ Certain defects in the international application
   VIII ☐ Certain observations on the international application

Date of submission of the demand 29/06/1999	Date of completion of this report 16.03.2000
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Frey, R Telephone No. +49 89 2399 7522

Form PCT/IPEA/409 (cover sheet) (January 1994)

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1,3-11	as originally filed			
2,12	as received on	27/01/2000	with letter of	24/01/2000

Claims, No.:

1-9	as received on	27/01/2000	with letter of	24/01/2000

Drawings, sheets:

1/3-3/3	as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-9
	No:	Claims	
Inventive step (IS)	Yes:	Claims	2
	No:	Claims	1, 3-9
Industrial applicability (IA)	Yes:	Claims	1-9
	No:	Claims	

2. Citations and explanations

   see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

   see separate sheet

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1.   Reference is made to the following documents:

    D1:   EP-A-0 304 998 (PHILIPS NV) 1 March 1989
    D2:   US-A-5 625 888 (RUETHER RALF ET AL) 29 April 1997
    D3:   US-A-5 371 783 (HEUNG CHARLEY ET AL) 6 December 1994
    D4:   EP-A-0 301 573 (NIPPON ELECTRIC CO) 1 February 1989

2.   The application does not meet the requirements of the PCT because the subject-matter of claim 1 does not involve an inventive step (Article 33(3) PCT).

Document D1, which is considered to represent the most relevant state of the art, discloses (see in particular column 2, line 29- column 3, line 3; column 4, lines 5-10; Fig. 1; column 5, line 43- column 6, line 49; Fig. 5), according to essential features of claim 1, a wireless telephone system which comprises:
one or more wireless handsets, each handset comprising a handset transceiver; and
a base unit comprising
a handset docking station having a wired interface (see in particular Fig. 1)
means for initializing the handset via the wired interface, when the handset is physically docked in the docking station (see in particular column 4, lines 5- 10); and
a base transceiver for communicating over a channel with each handset via its handset transceiver only if the handset has previously been initialized by the base unit (see in particular the wording "the base station makes security checks on the handsets using ... the ... security code address" in column 3, lines 1-2).

The subject-matter of claim 1 differs from that disclosed in D1 only in that during initialization a unique handset security code based on a unique and permanent handset serial number is read from the handset and stored to the base station

and that the determination wether the handset has been previously initialized is based on this handset security code.

Thereby secure communications between handsets and the base unit shall be achieved.

However, document D2 discloses, for the same purpose of providing a secure communication between handsets and a base unit (see in particular the correspondence between the wording "conduct unauthorized telephone calls" in column 2, lines 42- 49 of D2 and the wording "an unauthorized third party may use a bootleg wireless handset to communicate via the base unit" on page 2, line 2 of the application) , an initialization in which a unique and permanent handset security code is read from the handset and stored to the base station, see column 6, lines 29- 38. From the wording "an individual identification word allocated to the mobile station during its manufacture" it is clear that the difference between this unique and permanent handset security code and a "serial number" is of semantic nature. That the determination wether the handset has been previously initialized is based on the handset security code is implicitly included in such a scheme: otherwise there would be no reason for storing the handset security code in the base unit. Furthermore, it should be noted that the use of "serial numbers" as a basis for unique device security codes is explicitly disclosed in document D4 (see in particular column 1, lines 36- 41), which is referenced by document D2 and is therefore part of the disclosure of this document.

Consequently, the differentiating features have already been employed in a similar wireless telephone system according to document D2 and it would therefore be obvious to the person skilled in the art, namely when the same result is to be achieved, to apply these features with corresponding effect to a wireless telephone system according to document D1, thereby arriving at a wireless telephone system according to claim 1. The subject-matter of claim 1 does therefore not involve an inventive step (Article 33(3) PCT).

3.   The application does not meet the requirements of the PCT because the subject-matter of independent claims 8 and 9 does not involve an inventive step (Article 33(3) PCT).

The subject-matter of claims 8 and 9, which are directed to a method and a base unit, respectively, corresponds substantially to that of claim 1.

Therefore the objection as to lack of inventive step of claim 1 is applicable mutatis mutandis to claims 8 and 9.

4.   Dependent claims 3 to 7 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, the reasons being as follows.

The use of TDMA and therefore the bargaining of an audio slot (claim 3) is generally known from DECT-systems as disclosed in D2.

Scrambling (claim 4), which always necessitates knowledge of the scrambler seed by both parties of the communication, is common in radio systems, see e.g. D3, column 3, lines 54- 60).

A charging means (claim 5) is known from D1 (see in particular column 4, lines 5- 7).

Ensuring that the handset is sufficiently charged when performing the initialization (claim 6) is known from D1 (see in particular column 6, lines 18- 22). This ensures correct retransmission of a signal during initialization, i.e. it serves the same purpose of permitting normal functioning of the handset during initialization (see the paragraph bridging pages 8 and 9 of the application). Once this problem has been realized, as it has been in document D1, providing means for determining whether the voltage of the handset is below a threshold level is merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in order to solve the problem posed.

Messages comprising a plurality of fields (claim 7) are well-known, see e.g. Fig. 5 of D1 or Fig. 3 of D2.

5.   However, **Claim 2** meets the requirements of Articles 33(2), (3) and (4) PCT.

According to claim 2, in the wireless telephone system of claim 1 the base transceiver is adapted to communicate with a given handset only if the handset provides to the base unit its handset security code and a base unit security code which has been provided to the handset by the base unit.

This yields a further improvement of the security of the communication between the handset and the base unit.

Such a wireless telephone system is neither taught nor rendered obvious by the above-mentioned and the other prior art documents cited in the International Search Report.

The subject-matter of claim 2 is therefore novel and considered to involve the required inventive step, Articles 33(2) and (3) PCT. The subject-matter of this claim is also industrially applicable, Article 33(4) PCT.

Re Item VII
Certain defects in the international application

The summary in the opening part of the description is not in agreement with the wording of the amended independent claims.

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One problem that may be encountered in such situations is breach of security. For example, an unauthorized third party may use a "bootleg" wireless handset to communicate via the base unit. Without adequate security, these and other types of security breaches

5   may occur.

SUMMARY

A wireless telephone system, having one or more wireless handsets and a base unit. Each handset has a handset transceiver,

10   and the base unit has a base transceiver and a handset docking station, which has a wired interface. The base unit digitally communicates over an RF channel with a handset via its handset transceiver only if the handset has previously been initialized by the base unit. The handset is initialized via the wired interface when it is

15   physically docked in the docking station.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of TDMA multi-line wireless telephone system for initializing wireless handsets of the system, in accordance with an embodiment of the present invention;

20   Fig. 2 is a schematic representation of the message format for an initialization message exchange between the base unit and a handset of the telephone system of Fig. 1 via a wired link, for initializing the handset, in accordance with an embodiment of the present invention;

Fig. 3 is a flow diagram illustrating the handset initialization

25   performed by the system of Fig. 1, from the point of view of the base station, in accordance with an embodiment of the present invention; and

The rest of the processing chain shown in Fig. 4 (steps 405 *et seq.*) is a reflection of actions requested by the base. As discussed above, handset 120_i needs to have a response for each of the possible states that it can be in. In particular, depending on its initial status (which is one of 3 possible conditions discussed in the previous section), the base may request the following actions: local slot number assignment (step 406); User to Provide Local Message Assignment (step 407); or HS vs. Base ID Mismatch (step 408) (implying a requirement for a possible reprogramming of the handset based on the user's request). This allows a handset to be recharged in another base with the user prompting such an action only. Also, in the case where only a recharging function is carried out, there is no unique ring tone at the completion of the action. All other actions in the handset on completion result in a unique ring tone (step 425) which signals to the user that the handset and base have completed their actions.

One skilled in the art will recognize that the wireless system described above according to the principles of the invention may be a cellular system where base unit 110 represents a base station serving one of the cells in a cellular telephone network.

It will be understood that various changes in the details, materials, and arrangements of the parts which have been described and illustrated above in order to explain the nature of this invention may be made by those skilled in the art without departing from the principle and scope of the invention as recited in the following claims.

CLAIMS

1.   A wireless telephone system, comprising:

(a) one or more wireless handsets, each handset comprising a
handset transceiver; and

(b) a base unit comprising a base transceiver for communicating
over a channel with each handset via its handset
transceiver only if the handset has previously been
initialized by the base unit; a handset docking station
having a wired interface; and

means for initializing the handset via the wired interface.

2. The system of claim 1, wherein:

the means for initializing obtains from the handset and stores
locally a unique handset security code; and

the base unit allows a given handset to communicate over the
channel only if the handset provides to the base unit the
handset security code.

3. The system of claim 2, wherein:

the means for initializing further provides a unique base unit
security code to the handset; and

the base unit allows a given handset to communicate over the
channel only if the handset provides to the base unit the
base unit security code and the handset security code.

4. The system of claim 2, wherein:

the base transceiver establishes a time-division multiple access (TDMA) link with each handset via the handset transceiver in accordance with a TDMA epoch allocating exclusive audio packet time slots to each handset;

the means for initializing obtains from the handset and stores locally a unique handset security code and provides to the handset an exclusive audio packet slot number corresponding to its audio packet time slot; and

the base unit allows a given handset to communicate over the RF channel only if the handset provides to the base unit the handset security code and the audio packet slot number.

5. The system of claim 2, wherein:

digital communications between the base transceiver and the handset are scrambled in accordance with a scrambler seed unique to the handset that must be known to both the base transceiver and the handset; and

the means for initializing provides to the handset and stores locally the scrambler seed for the handset.

6. The system of claim 2, wherein the handset security code is based on a unique handset serial number.

7.   The system of claim 1, wherein:

the means for initializing provides to the handset a unique base unit security code based on a unique base unit serial number; and

the base unit allows a given handset to conduct digital communications over the RF channel only if the handset provides to the base unit the base unit security code and the handset security code.

8.   The system of claim 1, wherein:

each handset is battery powered by a rechargeable battery; and

the docking station comprises a charging means for recharging the battery of a handset physically docked in the docking station.

9.   The system of claim 8, wherein:

the base unit comprises means for determining whether the battery of the handset physically docked in the docking station has a voltage below a threshold level, wherein the means for initializing waits until after the battery voltage has been recharged above the threshold level before initializing the handset.

10.   The system of claim 1, wherein the handset and base unit exchange messages during the initialization in accordance with a message format comprising a plurality of fields.

11.   In a wireless telephone system having a base unit and one
or more wireless handsets, the base unit comprising a base
transceiver and a handset docking station having a wired interface,
each handset comprising a handset transceiver, a method comprising
5   the steps of:

(a) initializing a handset via the wired interface when the
handset is physically docked in the docking station; and

(b) conducting digital communications, over an RF channel,
between the base unit and the handset via the base unit
10   and handset transceivers, respectively, only if the handset
has previously been initialized by the base unit.

12.   A base unit for communicating with one or more wireless
handsets, each handset comprising a handset transceiver, comprising:

15   (a) a base transceiver for digitally communicating over an RF
channel with each handset via its handset transceiver only
if the handset has previously been initialized by the base
unit; and

(b) a handset docking station having a wired interface, wherein
20   the base unit initializes the handset via the wired
interface when the handset is physically docked in the
docking station.

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04M 1/72	A1	(11) International Publication Number: WO 99/31859
		(43) International Publication Date: 24 June 1999 (24.06.99)

(21) International Application Number: PCT/US98/18059

(22) International Filing Date: 1 September 1998 (01.09.98)

(30) Priority Data:
60/069,684   12 December 1997 (12.12.97)   US

(71) Applicant (for all designated States except US): THOMSON CONSUMER ELECTRONICS, INC. [US/US]; 10330 North Meridian Street, Indianapolis, IN 46290–1024 (US).

(72) Inventors; and
(75) Inventors/Applicants (for US only): RAMASWAMY, Kumar [IN/US]; 9417 College Drive #B, Indianapolis, IN 46240 (US). KNUTSON, Paul, Gothard [US/US]; 148 South Emerson Avenue, Indianapolis, IN 46219 (US). KAPADIA, Maneck, Behram [US/US]; 538 Arbor Drive, Carmel, IN 46032 (US).

(74) Agents: TRIPOLI, Joseph, S. et al.; GE & RCA Licensing Management Operation, Inc., P.O. Box 5312, Princeton, NJ 08540 (US).

(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.

(54) Title: INITIALIZATION OF HANDSETS IN A MULTI–LINE WIRELESS PHONE SYSTEM FOR SECURE COMMUNICATIONS

(57) Abstract

A wireless telephone system, having one or more wireless handsets and a base unit. Each handset has a handset transceiver, and the base unit has a base transceiver and a handset docking station, which has a wired interface. The base unit digitally communicates over an RF channel with a handset via its handset transceiver only if the handset has previously been initialized by the base unit. The handset is initialized via the wired interface when it is physically docked in the docking station.

INITIALIZATION OF HANDSETS IN A MULTI-LINE WIRELESS PHONE SYSTEM FOR SECURE COMMUNICATIONS

BACKGROUND OF THE INVENTION

5   ### Field of the Invention

The present invention relates to multi-line wireless telephone systems and, in particular, to providing secure communications in a time-division multiplexed (TDM) wireless telephone system.

Description of the Related Art

10   The use of telephones and telephone systems, including wireless telephone systems, is widespread. In wireless telephone systems, a cordless or wireless telephone handset unit communicates via either analog or digital radio signals with a base unit, which is typically connected via a standard telephone line to an external telephone
15   network. In this manner, a user may employ the wireless handset to engage in a telephone call with another user through the base unit and the telephone network.

Multi-line wireless telephone systems are in use in various situations, such as businesses with many telephone users. Such
20   systems employ a handset that communicates with up to N handsets simultaneously, typically with digital communications schemes, such as a spread-spectrum, time division multiple access (TDMA). In a TDMA system, a single RF channel is used, and each handset transmits and receives data during a dedicated time slice or slot within an
25   overall cycle or epoch. It is desirable to provide various features, such as private branch exchange (PBX) features and capabilities, in a multi-line wireless telephone system.

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One problem that may be encountered in such situations is breach of security. For example, an unauthorized third party may use a "bootleg" wireless handset to communicate via the base unit. Without adequate security, these and other types of security breaches

5   may occur.

SUMMARY

A wireless telephone system, having one or more wireless handsets and a base unit. Each handset has a handset transceiver,

10   and the base unit has a base transceiver and a handset docking station, which has a wired interface. The base unit digitally communicates over an RF channel with a handset via its handset transceiver only if the handset has previously been initialized by the base unit. The handset is initialized via the wired interface when it is

15   physically docked in the docking station.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of TDMA multi-line wireless telephone system for initializing wireless handsets of the system, in accordance with an embodiment of the present invention;

20   Fig. 2 is a schematic representation of the message format for an initialization message exchange between the base unit and a handset of the telephone system of Fig. 1 via a wired link, for initializing the handset, in accordance with an embodiment of the present invention;

Fig. 3 is a flow diagram illustrating the handset initialization

25   performed by the system of Fig. 1, from the point of view of the base station, in accordance with an embodiment of the present invention; and

Fig. 4 is a flow diagram illustrating the handset initialization performed by the system of Fig. 1, from the point of view of the handset being initialized, in accordance with an embodiment of the present invention.

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DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to Fig. 1, there is shown a block diagram of spread spectrum TDMA multi-line digital wireless telephone system 100, in accordance with an embodiment of the present invention.

10 TDMA system 100 comprises a base unit 110, which has receiver and transmitter units 112 and 111, respectively, and is coupled to external telephone network 116 via telephone line(s) 115. Base unit 110 also comprises docking station 118, for receiving a wireless handset and providing a wired interface between base unit 110 and

15 the handset. In addition, base unit 110 also has a controller/microprocessor 113 for controlling and monitoring the overall functions of the base unit 110.

System 100 also comprises N wireless handsets 120_1, 120_2, . . . 120_N. Each has a transmitter and receiver unit (transceiver),

20 such as transmitter 121 and receiver 122 of handset 120_1. In one embodiment, receiver unit 112 comprises N logical receivers, and transmitter unit 111 comprises N logical transmitters, so that receiver and transmitter units 112 and 111 provide N logical transceiver units, one for each of N wireless handsets. At any given time, M handsets (0

25 $\leq M \leq N$) are operating or active (i.e., in the process of conducting a telephone call).

The telephone system provided by system 100 preferably operates in the 900 MHz unlicensed band, and preferably provides

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features like that of a small PBX, in conjunction with PC 140. In one embodiment, system 100 employs a combination of time division multiplexing (TDM), such as TDMA, and frequency band selection to overcome interfering sources and to maintain reliable links between

5   the base-station and the handsets. In a digital TDMA scheme, each handset only transmits or receives data during its own "time slice" or slot. System 100 thus provides a wireless network between the base station 110 and each handset 120_i ($1 \le i \le N$). In one embodiment, N=4, so that system 100 comprises a maximum of 4 wireless handsets,

10   each having unique time slots in the TDMA epoch dedicated thereto.

As explained above, lack or breach of security in such a system is undesirable. Therefore, the telephone system of the present invention is configured to minimize this problem and to provide secure and robust communications between handsets and the base

15   unit. In the present invention, the base unit 110 is configured so that it will communicate only with handsets that are able to provide certain unique identifier (ID) information, or security code. This ID information may include information such as the slot number assigned to the handset (e.g., one of numbers 1-4 in a 4-line, 4-slot, 4-

20   handset system), as well as the handset serial number and/or the base serial number (or security codes based on the serial number), and the like. Only handsets 120_i that have been initialized by base unit 110 will be able to provide this information to the base unit 110; all non-initialized handsets will therefore not be able to communicate

25   as part of the telephone system 100.

In an alternative embodiment, in addition to the use of security codes such as the serial number, and slot number, a user-programmable scrambler code is employed. In this embodiment,

during initialization, the user of the handset is prompted to enter a random scrambler seed. This scrambler seed is then stored in both handset and base unit, and is used to scramble all future TDMA communications between the two. Since only the initialized handset

5   and the base unit know the scrambler seed, an unauthorized handset or other transceiver device will be unable to eavesdrop on the channel or use the handset's slot. Thus, the user-programmable scrambler provides an extra layer of security. In an alternative embodiment, the scrambler code or seed may be selected

10 automatically by the base unit and/or handset, without prompting the human user for input.

System 100 is configured so that base unit 110 has a physical docking station 118 or receptacle/port into which a non-initialized handset 120_i may be physically placed, to provide a wired link and

15 interface between the handset 120_i and base unit 110. The handset is then initialized by the base unit via the wired link. Because the physical location of the base unit and its docking station or port may be controlled and access thereto limited to authorized persons, and because a handset must be physically docked to the docking station in

20 order to engage in initialization, only an authorized person will be able to initialize a handset. Therefore, in the present invention, only handsets that have been initialized by the handset via the wired link, as a result of actions of an authorized user, will be able to engage in telephone communications with the telephone system, thus providing

25 communication security. The present invention is described in further detail below, with reference to Figs. 2-4.

Referring now to Fig. 2, there is shown a schematic representation of the message format 200 for an initialization

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message exchange between the base unit 110 and a handset 120_i of the telephone system 100 of Fig. 1 via a wired link, for initializing the handset 120_i, in accordance with an embodiment of the present invention. Message format 200 comprises a plurality of fields 201-

5   209 for the exchange of information between base unit 110 and a handset 120_i via the wired link provided by port 118, which are exchanged in order to initialize the handset. Messages sent to a docked handset 120_i from base unit 110 have message format 200, as do messages sent to base unit 110 from a docked handset 120_i. Port

10   118 may also double as the recharging port or cradle into which a handset may be placed to recharge its battery.

Whenever a non-initialized handset 120_i is placed in port 118 and is to be initialized, the base unit 110 provides information to the handset, and vice-versa, to initialize the handset so that future TDMA

15   communication may be conducted. In one embodiment, this information includes a security code or ID 205, a slot number 204, and a scrambler seed 207. In one embodiment, the security code is based on the serial number of the handset, and is preferably a 32 bit number. The security code may be identical to the serial number, or

20   a part or subset thereof. In an alternative embodiment, the security code is based on the serial number for the base unit, instead of or in addition to that of the handset. The security code is used to authenticate the handset every time any messages are to be exchanged between the base and a handset. In addition to the time

25   slot mechanism, this security code provides a secure exchange of messages from the base to the handset.

The slot number for the handset is a 3 bit number, which is assigned by base unit 110, and transmitted via the wired link to the

handset. The slot number is a unique time slot number, which distinguishes handset 120_i from other handsets in system 100. The scrambler seed is an 8-bit number, also based on the serial number of the base unit, or, alternatively, user programmable through a serial

5 computer interface or other input (e.g. the keypad of the wireless phone), and is used to generate the code that randomizes the spectrum of transmitted information. Since such encoding employs a deterministic mapping, which is known only to the transceivers of the handset and base unit, it can provide additional security, as described

10 above.

Message format is, in one embodiment, a 72-bit field 200 having an unused field 208 for future expansion as shown in Fig. 2. Message number field 201 is a 4-bit field, modulo generated at each end of a transmission, which helps keep track of the state of the

15 other end. This field is also used for positive acknowledgments. Message type field 202 is a 4-bit field, used to signal different types of messages that can possibly be exchanged between base and handsets. New/existing field 203 is a 1-bit field that indicates whether the handset is a new handset or existing handset, where 0 =

20 new handset. For packets originating from base unit 110, this field is always set to 0.

As described previously, local number field 204 is a 3-bit field that indicates the local (slot) number assigned to an existing handset. This number is ignored if new/existing field 203 is set to 0. 32-Bit ID

25 field 205 indicates the security code or ID, which is derived from the factory designated ID for handset 120_i. This will form the basis for secure communications between the base and handsets registered with the base (i.e., initialized). A 5-bit ack message field 206 contains

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the 4-bit message number that is being acknowledged, plus an ack bit. In this format, bits 0-3 represent the message number being acknowledged, and bit 4 represents negative ack if 0, and positive ack if 1. The generation of the acknowledgment is based on the CRC check

5   done at the receiving end. Scrambler seed field 207 is an 8-bit field used to seed the scrambler in the RF link. It forms an additional layer of security. This may be default generated from the factory code or programmed through the serial computer interface by a user. CRC code field 209 is an 8-bit cyclic redundancy check code used for error

10 detection and correction.

Referring now to Fig. 3, there is shown a flow diagram 300 illustrating the handset 120ᵢ initialization performed by system 100 of Fig. 1 under the control of CPU 113, from the point of view of base station 110, in accordance with an embodiment of the present

15 invention. A handset placed or "docked" into port 118 may be already initialized and docked only for recharging. Alternatively, a non-initialized handset (i.e., either a "new" handset that has never been initialized, or a handset previously initialized for a different base unit) may be docked in port 118 in order to initialize the

20 handset for base unit 110. Additionally, an already-initialized handset may be docked in port 118 in order to re-program or change some of the initialization parameters, i.e. to re-initialize the handset. In the latter cases, the handset may still need recharging.

Thus, base unit 110 first polls the relevant I/O device to detect

25 the presence of the handset on the recharge cradle, i.e. port 118 (step 301). When a handset 120ᵢ is docked in port 118 (i.e., the recharge cradle), base unit 110 first checks to see if the voltage level of the battery of handset 120ᵢ is above a certain threshold that would

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permit normal functioning of the handset (step 302). If not, no further processing steps take place until the handset recharges to a sufficient voltage.

Once the threshold voltage requirement is satisfied (step 302), base unit 110 initiates the messaging protocol, in accordance with message format 200, by sending the initial message through the wired interface of port 118 to the handset 120_i (step 303). This message is a sign on message which is indicated in the message type field 202 with 0. This starts a sequence of events that are described from the viewpoint of base unit 110 in Fig. 3 and from the viewpoint of handset 120_i in Fig. 4. All messages exchanged between the handset and base are asynchronous in nature. The general goal of this procedure is to either allow for a normal recharge or to initialize a non-initialized handset. In the initial message, base unit 110 fills in the following fields: message number field 201, message type filed 202 (where sign on message = 0), and the CRC field 209. (If the CRC does not match at the handset, it sends a negative acknowledge back to base unit 110 with the message number, in which case base unit 110 sends a retransmit message to the handset (not shown in Fig. 3). All messages with CRC need acknowledgment even where not indicated in Fig. 3.)

At this point, base unit 110 expects an acknowledge from handset 120_i (step 304). If an acknowledge is not received before a timer times out, the procedure starts again (steps 305, 306, 301). If an acknowledge is received before time out (step 304), then base unit 110 can determine whether the docked handset is "new" or has already been initialized (step 311). Handset 120_i at step 311 may have one of 3 states: it may be a new handset, it may be already

initialized by base unit 110, or it may have been initialized previously by a different base unit.

In case the handset's message indicates a new handset (in which case the handset's message contains the handset's ID in field 205), the base needs to check if it has a local number or slot available (step 312). For example, in a 4-handset system, if 4 handsets are already initialized and thus registered with base unit 110, no slot will be available. If the base unit 110 has an available local number, then the base unit 110 will assign it to the handset by updating the message fields (step 313). In this case, base unit 110 fills out the following fields for the message: message number field 201, message type field 202, unique system ID field 205, local slot number assignment field 204, scrambler seed field 207, and CRC field 209. In this case, ID field 205 contains the serial number of base unit 110.

If it is determined that handset 120_i is new, but there is no slot available (step 312), base unit 110 assumes that the user is trying to replace an existing handset with handset 120_i. In this case, the user is prompted to provide information about what local number needs to be replaced. This is accomplished by a message sent from the base to the handset which then displays a Local Number request and an audio warning (step 321). Once a response with a valid slot number is received from the handset as a result of this query (steps 322, 323), base unit 110 completes the local slot number assignment and fills out the specified fields for the message (step 313). If no response is received from the handset, a timeout is issued and the base starts at the top of its execution (step 324).

When handset 120_i is not a new handset (step 311), base unit 110 checks the 32 bit ID, local number, and scrambler seed

transmitted by handset 120_i. If these numbers match the information stored in base unit 110's memory, the base program exits (step 331). If there is a mismatch, then the base sends a reprogram message (message type = 8) to the handset (steps 331, 332). This

5   message is filled in the following fields: message number field 201, message type field 202, and CRC field 209.

If base unit 110 receives a positive acknowledgment, it follows the processing chain as if it is dealing with a new handset, so that it can re-initialize the handset (steps 333, 312). In case it receives a

10   negative acknowledge or times out, it exits the service routine (steps 333, 334, 335).

Referring now to Fig. 4, there is shown a flow diagram 400 illustrating the handset 120_i initialization performed by system 100 of Fig. 1, from the point of view of handset 120_i, in accordance with

15   an embodiment of the present invention. As will be appreciated, the processing flow in handset 120_i mirrors that in base unit 110, described above with reference to Fig. 3. Once the initial sign-on message is received correctly from the base (step 403), handset 120_i responds with an acknowledgment including old/new and related

20   handset information (step 404). In particular, if the handset is new, it responds (step 404) with a message having the following fields filled in: message number field 201, message type field 202 (=1), new/existing handset field 203 (=0; "new"), and CRC field 209. If handset 120_i has already been initialized, it responds with a message

25   having the following fields filled in: message number field 201, message type field 202, new/existing handset field 203 (=1; "preinitialized"), unique system ID field 205, local slot number assignment field 204, scrambler seed field 207, and CRC field 209.

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The rest of the processing chain shown in Fig. 4 (steps 405 *et seq.*) is a reflection of actions requested by the base. As discussed above, handset 120_i needs to have a response for each of the possible states that it can be in. In particular, depending on its initial status

5   (which is one of 3 possible conditions discussed in the previous section), the base may request the following actions: local slot number assignment (step 406); User to Provide Local Message Assignment (step 407); or HS vs. Base ID Mismatch (step 408) (implying a requirement for a possible reprogramming of the handset

10   based on the user's request). This allows a handset to be recharged in another base with the user prompting such an action only. Also, in the case where only a recharging function is carried out, there is no unique ring tone at the completion of the action. All other actions in the handset on completion result in a unique ring tone (step 425)

15   which signals to the user that the handset and base have completed their actions.

One skilled in the art will recognize that the wireless system described above according to the principles of the invention may be a cellular system where base unit 110 represents a base station serving

20   one of the cells in a cellular telephone network.

It will be understood that various changes in the details, materials, and arrangements of the parts which have been described and illustrated above in order to explain the nature of this invention may be made by those skilled in the art without departing from the

25   principle and scope of the invention as recited in the following claims.

1 3
CLAIMS

1.   A wireless telephone system, comprising:

5   (a) one or more wireless handsets, each handset comprising a
handset transceiver; and

(b) a base unit comprising a base transceiver for communicating
over a channel with each handset via its handset
transceiver only if the handset has previously been

10   initialized by the base unit; a handset docking station
having a wired interface; and

means for initializing the handset via the wired interface.

2.   The system of claim 1, wherein:

15   the means for initializing obtains from the handset and stores
locally a unique handset security code; and

the base unit allows a given handset to communicate over the
channel only if the handset provides to the base unit the
handset security code.

20

3.   The system of claim 2, wherein:

the means for initializing further provides a unique base unit
security code to the handset; and

the base unit allows a given handset to communicate over the

25   channel only if the handset provides to the base unit the
base unit security code and the handset security code.

4.   The system of claim 2, wherein:

the base transceiver establishes a time-division multiple access
(TDMA) link with each handset via the handset

5   transceiver in accordance with a TDMA epoch allocating
exclusive audio packet time slots to each handset;

the means for initializing obtains from the handset and stores
locally a unique handset security code and provides to the
handset an exclusive audio packet slot number

10   corresponding to its audio packet time slot; and

the base unit allows a given handset to communicate over the
RF channel only if the handset provides to the base unit
the handset security code and the audio packet slot
number.

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5.   The system of claim 2, wherein:

digital communications between the base transceiver and the
handset are scrambled in accordance with a scrambler
seed unique to the handset that must be known to both

20   the base transceiver and the handset; and

the means for initializing provides to the handset and stores
locally the scrambler seed for the handset.

6. The system of claim 2, wherein the handset security code is
25   based on a unique handset serial number.

7. The system of claim 1, wherein:

the means for initializing provides to the handset a unique base unit security code based on a unique base unit serial number; and

the base unit allows a given handset to conduct digital communications over the RF channel only if the handset provides to the base unit the base unit security code and the handset security code.

8. The system of claim 1, wherein:

each handset is battery powered by a rechargeable battery; and

the docking station comprises a charging means for recharging the battery of a handset physically docked in the docking station.

9. The system of claim 8, wherein:

the base unit comprises means for determining whether the battery of the handset physically docked in the docking station has a voltage below a threshold level, wherein the means for initializing waits until after the battery voltage has been recharged above the threshold level before initializing the handset.

10. The system of claim 1, wherein the handset and base unit exchange messages during the initialization in accordance with a message format comprising a plurality of fields.

11.   In a wireless telephone system having a base unit and one
or more wireless handsets, the base unit comprising a base
transceiver and a handset docking station having a wired interface,
each handset comprising a handset transceiver, a method comprising
5   the steps of:

(a)   initializing a handset via the wired interface when the
handset is physically docked in the docking station; and

(b)   conducting digital communications, over an RF channel,
between the base unit and the handset via the base unit
10   and handset transceivers, respectively, only if the handset
has previously been initialized by the base unit.

12.   A base unit for communicating with one or more wireless
handsets, each handset comprising a handset transceiver, comprising:
15   (a) a base transceiver for digitally communicating over an RF
channel with each handset via its handset transceiver only
if the handset has previously been initialized by the base
unit; and

(b) a handset docking station having a wired interface, wherein
20   the base unit initializes the handset via the wired
interface when the handset is physically docked in the
docking station.

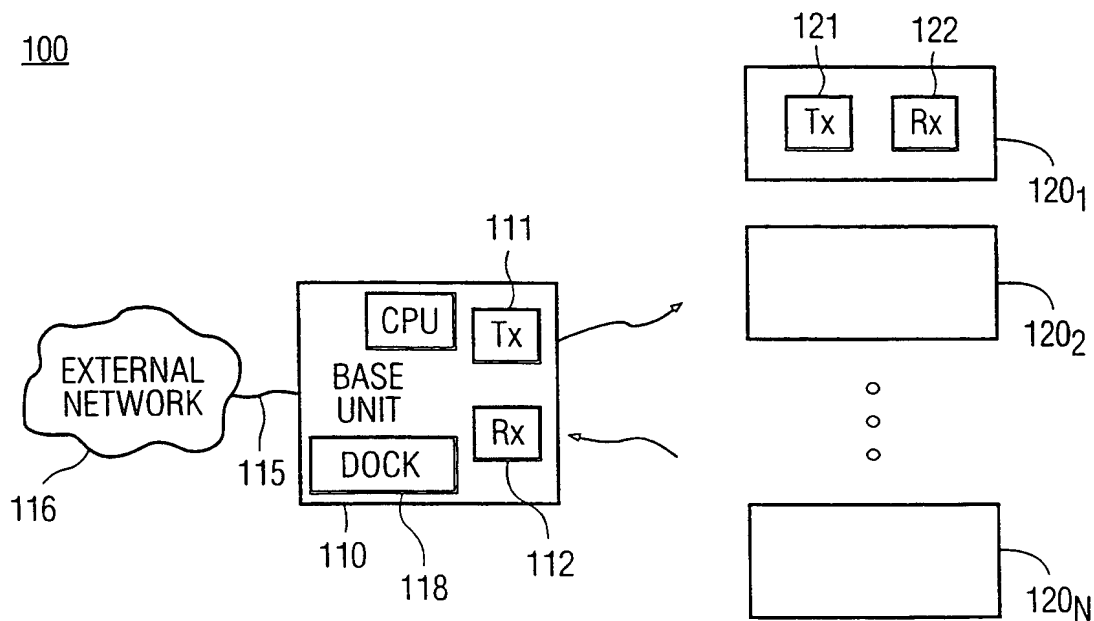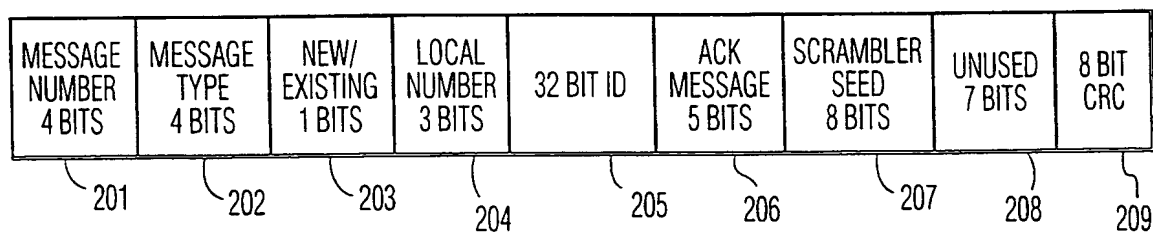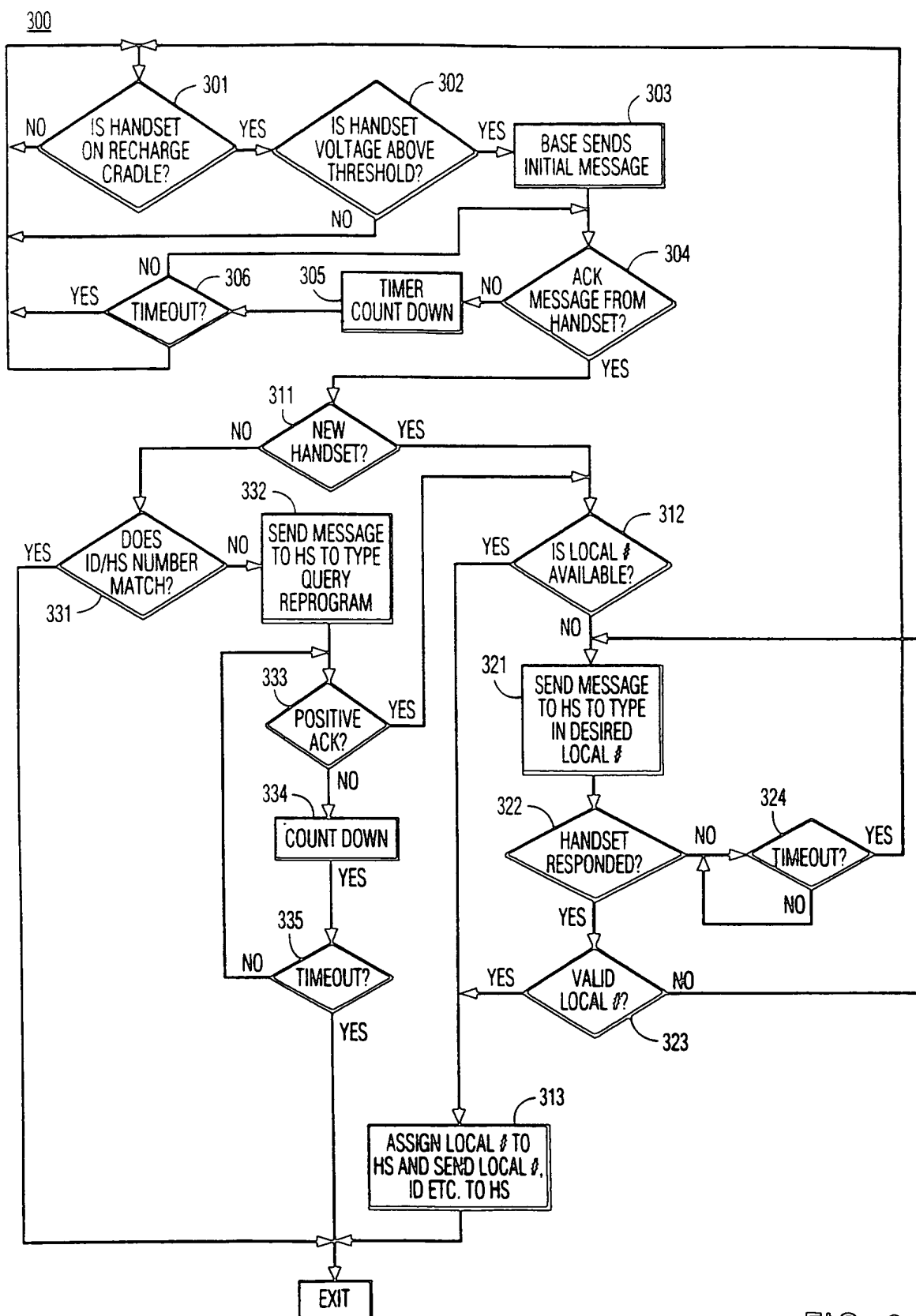FIG. 1

FIG. 2

FIG. 3

400

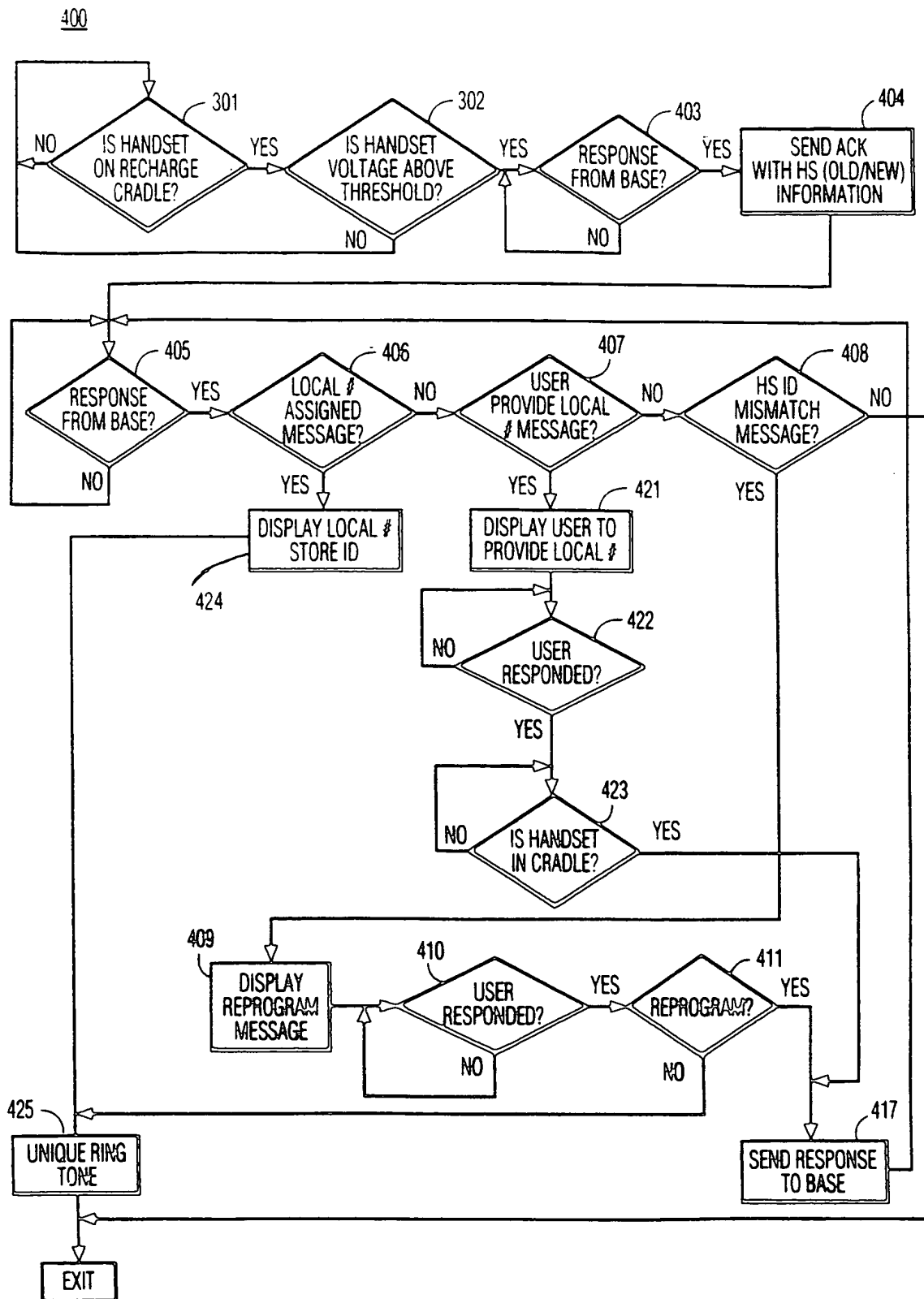
FIG. 4

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04M1/72

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04M H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	see column 2, line 29 - column 3, line 3	2,3,11, 12
	see column 4, line 5-10; figure 1	
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A	see column 6, line 18-22	9

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A	see column 2, line 10-41; claim 1	4

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| X | Further documents are listed in the continuation of box C. | X | Patent family members are listed in annex. |

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 December 1998	18/12/1998

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Intnal Application No

PCT/US 98/18059

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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